

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mark Van Ness on November 3, 2008 for application number 10611770.

The application has been amended as follows:

AMENDMENTS TO THE SPECIFICATION

Please amend paragraph 0012 as follows:

[0012] **Fig. 2** is a block diagram illustrating an example embodiment of data network. Data network 200 is intended to represent any data network, including, but not limited to a local area network, a personal area network, a wide area network, ~~such as the Internet, or a~~ metropolitan area network, or the Internet. For purposes of illustration and ease of explanation, a data network is described. However, embodiments of the invention are not limited to data networks.

Please amend paragraph 0016 as follows:

[0016] **Fig. 3** is a block diagram illustrating an example embodiment of a network device. Network device 204 includes receive queue 300, which buffers one or more packets

received from source electronic device 202. Network device 204 further includes search unit 302, which performs the multi-field matching search technique described more fully below. Search unit 302 may be implemented in digital hardware logic, e.g., as an application specific integrated circuit (ASIC), in software, e.g., as ~~machine-readable~~ computer-readable instructions ~~or machine-accessible instructions~~ that, when executed, cause network device 204 to perform the multi-field search technique described herein, or as a combination of software and hardware.

Please amend paragraph 0037 as follows:

[0037] Fig. 4 describes example embodiments of the invention in terms of a computer-implemented method. However, one should also understand it to represent a ~~machine-accessible~~ computer-readable storage medium having recorded, encoded or otherwise represented thereon instructions, routines, operations, control codes, or the like, that when executed by or otherwise utilized by an electronic system, cause the electronic system to perform the methods as described above or other embodiments thereof that are within the scope of this disclosure.

Please amend paragraph 0038 as follows:

[0038] **Fig. 6** is a block diagram illustrating one embodiment of an electronic system. The electronic system is intended to represent a range of electronic systems, including, for example, a personal computer, a personal digital assistant (PDA), a laptop or palmtop computer, a cellular phone, a computer system, a network access device, etc. Other electronic systems can include more, fewer and/or different components. The computer-implemented methods of Fig. 4 can be implemented as sequences of instructions executed by the electronic system. The sequences of instructions can be stored by the electronic system, or the instructions can be received by the electronic system (e.g., via a network connection). The electronic system can be

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coupled to a wired network, e.g., via a cable such as a coaxial cable, a fiber optics cable, or a twisted-pair phone line, a wireless network, e.g., via radio or satellite signals, or a combination thereof.

Please amend paragraph 0042 as follows:

[0042] Instructions are provided to memory from a ~~machine-accessible~~ computer-readable storage medium, or an external storage device accessible via a remote connection (e.g., over a network via network interface 680) providing access to one or more electronically-accessible media, etc. A ~~machine-accessible~~ computer-readable storage medium includes any mechanism that ~~provides (i.e., stores and/or transmits)~~ stores information in a form readable by a ~~machine (e.g., a computer)~~ a computer. For example, a ~~machine-accessible~~ computer-readable storage medium includes RAM; ROM; magnetic or optical storage medium; or flash memory devices; ~~electrical, optical, acoustical or other form of propagated signals (e.g., carrier waves, infrared signals, digital signals);~~ etc.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Currently amended) A computer-implemented method utilizing a processor comprising:

grouping single fields of a multiple-field source in a computer memory into a plurality of multiple-field keys (MFKs) of a search target, each MFK of the search target having single fields that correspond to single fields in one of a plurality of multiple-field vectors (MFVs) of entries in a data structure;

~~generating~~ utilizing the processor to generate a set of queries based, at least in part, on the MFKs, wherein each query includes one or more of the MFKs and wherein each query has a different MFK as a lead MFK;

using a query to determine whether the non-wildcard values in the MFVs of an entry match the non-wildcard values in corresponding MFKs of the search target; and;

if an entry has non-wildcard values in the MFVs that match the corresponding non-wildcard values in the MFKs, then performing an operation associated with the matching entry; or

if no entry has non-wildcard values in the MFVs that match the corresponding non-wildcard values in the MFKs, then using the queries to determine whether the entry has non-wildcard values in a MFV that match the non-wildcard values in a corresponding lead MFK, ~~plus~~ and whether remaining MFVs ~~that~~ of the entry match corresponding remaining MFKs based on matching the non-wildcard values and wildcard values.

2. (Currently amended) The method of claim 1, wherein the entries of the data structure are stored in the computer memory such that the MFVs that have non-wildcard values are located at the end of the entry.

4. (Currently amended) The method of claim 1, wherein the non-wildcard values comprise a fixed ~~value and/or value~~, a range of fixed values, or both.

5. (Currently amended) The method of claim 1, further comprising:
locating the entry having non-wildcard values in the MFV that match the non-wildcard values in the corresponding lead ~~MFK, plus MFK and having~~ remaining MFVs that match corresponding remaining MFVs based on matching the non-wildcard values and wildcard values;
and
performing an operation associated with the located entry.

10. (Currently amended) An apparatus comprising:
a processor to process data;
a computer memory to store data, the computer memory including a data structure having a plurality of entries, wherein each entry has a group of multiple-field vectors (MFVs) that each include a number of single fields having all wildcard values or all non-wildcard values; and

a search unit to group single fields of a multiple-field source into a plurality of multiple-field keys (MFKs) of a search target, each MFK having single fields that correspond to the single fields in a corresponding MFV of the entries in the data structure, generate a set of queries based, at least in part, on the MFKs, wherein each query includes one or more of the MFKs and has a different MFK as a lead MFK, use a query to determine whether the non-wildcard values in the MFVs of an entry match the non-wildcard values in corresponding MFKs of the search ~~target; and, target; and:~~

if an entry has non-wildcard values in the MFVs that match the corresponding non-wildcard values in the MFKs, then performing an operation associated with the matching entry; or

if no entry has non-wildcard values in the MFVs that match the corresponding non-wildcard values in the MFKs, using the queries to determine whether the entry has non-wildcard values in a MFV that match the non-wildcard values in a corresponding lead MFK, ~~plus~~ and whether remaining MFVs ~~that~~ of the entry match corresponding remaining MFKs based on matching the non-wildcard values and wildcard ~~values.~~ values.

11. (Currently amended) The apparatus of claim 10, wherein the entries of the data structure are stored in the computer memory such that the MFVs that have non-wildcard values are located at the end of the entry.

13. (Currently amended) The apparatus of claim 10, wherein the non-wildcard values comprise a fixed ~~value and/or~~ value, a range of fixed values, or both.

14. (Currently amended) The apparatus of claim 10, wherein the search unit locates the entry having non-wildcard values in the MFV that match the non-wildcard values in the corresponding lead MFK, ~~plus~~ MFK and having remaining MFVs that match corresponding remaining MFKs based on matching the non-wildcard values and wildcard values; and performs an operation associated with the located entry;

19. (Currently amended) An article of manufacture comprising:
a ~~machine-accessible~~ computer-readable storage medium including thereon sequences of instructions that, when executed, cause ~~an electronic system~~ a processor to:

group single fields of a multiple-field source in a computer memory into a plurality of multiple-field keys (MFKs) of a search target, each MFK of the search target having single fields that correspond to single fields in one of a plurality of multiple-field vectors (MFVs) of entries in a data structure;

generate a set of queries based, at least in part, on the MFKs, wherein each query includes one or more of the plurality of MFKs and wherein each query has a different MFK as a lead MFK;

use a query to determine whether the non-wildcard values in the MFVs of an entry match the non-wildcard values in corresponding MFKs of the search target; and;

if an entry has non-wildcard values in the MFVs that match the corresponding non-wildcard values in the MFKs, then performing an operation associated with the matching entry; or

if no entry has non-wildcard values in the MFVs that match the corresponding non-wildcard values in the MFKs, then use the queries to determine whether the entry has non-wildcard values in a MFV that match the non-wildcard values in a corresponding lead MFK, ~~plus~~ and whether remaining MFVs ~~that~~ of the entry match corresponding remaining MFKs based on matching the non-wildcard values and wildcard values.

20. (Currently amended) The article of manufacture of claim 19, wherein the entries of the data structure are stored in computer memory such that the MFVs that have non-wildcard values are located at the end of the entry.

21. (Currently amended) The article of manufacture of claim 19, wherein the ~~machine-accessible~~ computer-readable storage medium further comprises sequences of instructions that, when executed, cause the electronic system to arrange the entries of the data structure so that the MFVs that have non-wildcard values are placed at the end of the entry.

22. (Currently amended) The article of manufacture of claim 19, wherein the non-wildcard values comprise a fixed ~~value and/or~~ value, a range of fixed values, or both.

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23. (Currently amended) The article of manufacture of claim 19, wherein the ~~machine-accessible~~ computer-readable storage medium further comprises sequences of instructions that, when executed, cause the ~~electronic system~~ processor to:

locate the entry having non-wildcard values in the MFV that match the non-wildcard values in the corresponding lead MFK, ~~plus~~ MFK and having remaining MFVs that match corresponding remaining MFKs based on matching the non-wildcard values and wildcard values; and

perform an operation associated with the located entry.

28. (Currently amended) A system, comprising:

a processor;

a network interface coupled with the processor; and

an article of manufacture comprising a ~~machine-accessible~~ computer-readable storage medium including thereon sequences of instructions that, when executed, cause ~~an electronic system~~ a processor to:

group single fields of a multiple-field source into a plurality of multiple-field keys (MFKs) of a search target, each MFK of the search target having single fields that correspond to the single fields in one of a plurality of multiple-field vectors (MFVs) of entries in a data structure;

generate a set of queries based, at least in part, on the MFKs, wherein each query includes one or more of the plurality of MFKs and has a different MFK as a lead MFK;

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use a query to determine whether the non-wildcard values in the MFVs of an entry match the non-wildcard values in corresponding MFKs of the search target; and;

if an entry has non-wildcard values in the MFVs that match the corresponding non-wildcard values in the MFKs, then performing an operation associated with the matching entry; or

if no entry has non-wildcard values in the MFVs that match the corresponding non-wildcard values in the MFKs, then use the queries to determine whether the entry has non-wildcard values in a MFV that match the non-wildcard values in a corresponding lead MFK, ~~plus~~ and whether remaining MFVs ~~that~~ of the entry match corresponding remaining MFKs based on matching the non-wildcard values and wildcard values.

29. (Currently amended) The system of claim 28, wherein the non-wildcard values comprise a fixed ~~value and/or value~~, a range of fixed values, or both.

Any response to this Office Action should be **faxed to** (571) 273-8300 **or mailed to:**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Hand-delivered responses should be brought to

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Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Sai-Ming Chan whose telephone number is (571) 270-1769. The Examiner can normally be reached on Monday-Thursday from 8:00 am to 5:00 pm.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Seema Rao can be reached on (571) 272-3174. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) or 571-272-4100.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist/customer service whose telephone number is (571) 272-2600.

/Sai-Ming Chan/

Examiner, Art Unit 2616

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/Seema S. Rao/

Supervisory Patent Examiner, Art Unit 2416